MULTI-PROGRAMMED OPERATING

SYSTEMS FOR MULTI-USERS

AND TIME-SHARING

Dear Sir:

This seminar, through its step-by-step approach to building operating system software will give you the insight needed to accurately evaluate claims of hardware manufacturers, and the merits of alternative operating systems in the context of their proposed application.

By lifting the lid off the software "black box", it will give you a better understanding of what you can -- and cannot -- achieve with your present computer installation. And it will provide you with needed guidelines to the time-sharing potential of computer systems now in being or on the horizon.

This seminar is intended for those who have a systems or operating responsibility and who are interested in maximum utilization of their computer systems. It presents techniques that will accomplish this, and, in addition, that will minimize waiting time for individual users of the system. A demonstration shows how.

The demonstration is programmed for the IBM 7094. Basic to the system is a complete multi-programming executive which controls the concurrent execution of several programs in a common memory.

To demonstrate the multi-programming aspects, a number of user programs are first executed singly and independent of the executive routine. These same programs are then run concurrently under control of the multi-program executive. By timing the throughput for the execution of all programs when run in both modes, the effect of multi-programming is shown to give improvements of between twenty-five and forty-five percent - in effect, an increase of the capacity of the entire computer system by these amounts.

Coincident with running the system under multi-program control, we are also able to demonstrate its use as a continuous processor. In this case, new jobs are accepted for running on the system as they are introduced -- either singly or in batches -- to the on-line card reader. When the job is accepted, an operator-mounting instruction message is printed out on the on-line printer and the new job is then included as a member of the multi-programmed set.

Two interesting features of the demonstration are that the I/O operations required for acceptance -- card read, operator-message printing and program-tape loading -- are also multi-programmed with the members of the multi-program set. In addition, all jobs introduced to the system are given a priority for execution. These priorities are then observed throughout the execution of all current operating programs as well as when new jobs are introduced while the system is running.

The body of the seminar is a step-by-step illustration of the design of a multi-programming executive and a continuous processing system operated under control of this executive.

This revealing exposition of the workings of large computer software systems provides the background for your participation in realistic discussions of important related matters. These include remote console systems, language requirements for effective use of such a system, service functions that can be supplied within the system, and techniques for eliminating or reducing many "bottleneck" aspects of operating systems as they exist today. Particular emphasis is put on solutions to hardcopy output problems. Finally, the subject of multi-processing software, and simulation models for such software, is discussed.

In order to make it possible for you to derive maximum value from the class, the number of registrations is limited. The class sessions will be aimed at covering the rather full outline described in the enclosed brochure. To enroll, mail the enclosed registration form now.

Sincerely,

Robert D. Nixon
Director

REGISTRATION: Tuition, including noon meals and the course material, is $275 for the first student and $250 for each additional student from the same organization. Classes begin each day at 9 a.m., and continue through 5 p.m.

HOTEL ACCOMMODATIONS:—The seminar is at the Georgetown Inn, 1310 Wisconsin Avenue, N.W., Washington, D. C. 20007. The Inn is holding a block of rooms for seminar participants at $16 for single and $18 for twin rooms, until two weeks before the seminar. Hotel rooms are not included in the tuition, but reservation cards are furnished by IAT upon registration. Free parking is available.

OTHER COURSES:—The Institute for Advanced Technology program covers many subjects in the field of data processing and the management sciences. Among the seminars currently scheduled are:

Survey of Data Communications

Advanced Methods for Production Planning and Scheduling

Advanced Business Systems Analysis

Advanced Methods for Inventory Control and Management

Advanced Mathematical Programming by Mr. E. Martin L. Beale
  (1) Linear Programming
  (2) Non-Linear Programming

Computer Operations Management

Document Retrieval and Display Techniques

For an outline of these courses, or to be placed on the mailing list for seminar announcements, write:

REGISTRAR
C-E-I-R
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Washington, D.C. 20016
Phone: Area Code 301/652-2268

C-E-I-R is an international applied research and data processing corporation that offers analytical, scientific and computer services to business, science and government. Founded in 1954, it is today the world's largest, most experienced and best equipped independent organization in its field. The C-E-I-R professional staff includes several hundred mathematicians, statisticians, economists, operations researchers, management scientists and others from a variety of disciplines. In addition, many of the finest scientific and professional men in America are retained on a consultant basis. Augmenting this professional capability are modern electronic computing equipment, and skilled computer programmers and operations personnel at computing centers in five major U.S. cities. The Hague, Mexico City, and San Juan.

Institute for Advanced Technology is the latest expression of C-E-I-R's long-standing involvement in management education. The revolutionary nature of computer-based methods made education an integral part of C-E-I-R operations from the beginning. This relationship is formalized through the Institute for Advanced Technology. IAT faculty members are drawn primarily from the ranks of C-E-I-R's professional and computer operations staffs. Its curriculum is drawn from subjects in which C-E-I-R staff members are expert—recognized for excellence in day-to-day application of the art and science of computer usage to the real problems of C-E-I-R customers in business and industry. Sharing these new skills through seminars in major cities, management clinics, and special, inplant training programs is the major goal of the Institute for Advanced Technology.

MULTI-PROGRAMMED OPERATING SYSTEMS

A THREE-DAY SEMINAR

APRIL 5 thru 7, 1967
GEORGETOWN INN
WASHINGTON, D. C.

This is an objective presentation of the construction of a multi-programming executive and of a continuous processing system operated under control of this executive program. It is intended for working data processing personnel interested in achieving maximum utilization of a computing system.

The software systems covered in the seminar are demonstrated on an IBM 7094, and shows, in effect, an increase of 25-to-45 per cent in the capacity of the system. The course covers important related matters, including remote console systems, time-sharing potential of various hardware systems, and language requirements. Tuition, including noon meals and the text, "MULTI-PROGRAMMED OPERATING SYSTEMS," is $275 ($250 for additional students from the same organization).

INSTRUCTORS

LEO J. COHEN is President of Leo J. Cohen Associates, Inc., and an active member of IEEE, ACM and SIAM. His career in the computing industry began in 1954 at the UNIVAC Applications Research Center where he worked under the direction of Dr. John Mauchly. In 1957 he joined the Burroughs Corporation as head of the mathematics group in the Ballistic Missile Division. In 1959 he left Burroughs to work as an independent consultant in the field of scientific computation and computer systems design and, in 1963, formed the company which bears his name.

During his long experience in the direct application of computers and computing technology to the practical questions of achieving feasible solutions to a variety of scientific and data processing problems, Mr. Cohen has worked on a number of problems in the multi-programming and multi-processing field.

JAMES L. CHASE'S experience in the computing industry began in June 1955 with Remington Rand UNIVAC, where he spent five years as a Senior Systems Analyst and Site Systems Manager. He left Remington Rand in 1960 to serve as a consultant on the staff of Applied Data Research of Princeton, New Jersey, for three years, and since then has held the position of Project Manager with Leo J. Cohen Associates.

During this time, Mr. Chase's software design and implementation experience has covered an extremely wide variety of computing systems. In particular, for the past two years he has been engaged almost exclusively in software development for multi-programming and multi-processor systems.

MULTI-PROGRAMMED

OPERATING SYSTEMS

COURSE OUTLINE

NATURE OF SYSTEMS INPUTS AND OUTPUTS

Input/Output Categories □ Input/Output Sources □ Input/Output Devices □ Systems Levels of Inputs and Outputs

BATCH PROCESSING

Methodology □ Advantages and Disadvantages

CONTINUOUS PROCESSING

Philosophy □ Job Receipt □ Job Output □ Design of a Continuous Processing System

MULTI-PROGRAMMING IN CONTINUOUS PROCESSING OPERATING SYSTEMS

Philosophy □ Throughput Considerations □ Program States □ Controller Algorithm □ The Multi-Programming Executive □ I/O and Priority Control □ The Input/Output Package □ Miscellaneous Executive Functions

TWO CURRENT OPERATING SYSTEMS

System 360/50 □ 625 GECOS

A MULTI-PROGRAMMING OPERATING SYSTEM

Operating System Functions □ The Modular Operating System Concept . . . The Receiver Program; The Director Program; The Loader Program; The Output Program □ Interface Considerations Between Operating System Modules □ Allocation and Relocation . . . The Memory Allocator; The Device and Channel Allocator; The Status File Allocator

PROCESS FLOW IN A MULTI-PROGRAMMING OPERATING SYSTEM

Job Request Flow . . . Priority; Translation; Process; Multi-Task Jobs □ Program Control Flow . . . I/O Calls; I/O Interrupts; Error Analysis and Control; Memory Protection; Data Security

SYSTEM SERVICES

Data File Services □ Program File Services □ Generalized and Generative Routines □ Debugging Aids □ System Commands □ System Language

TIME-SHARING AND REAL-TIME CONSIDERATIONS

Priority Considerations □ Communications Considerations □ Remote Consoles □ User Interface Requirements □ Throughput vs. Real-Time Performance

LANGUAGE REQUIREMENTS

Programming Requirements . . . Statement-at-a-Time Compilation; Fragment (Multi-User) Compilation; State-Free Object Programs □ System Command Language

HARDWARE CONSIDERATIONS FOR MULTI-PROGRAMMING

MULTI-PROGRAMMING AND MANAGEMENT

Logging and Accounting □ Turn Around Time Prediction □ Priority Assignment □ Scheduling □ Costing

THE MULTI-PROGRAMMING DEMONSTRATION

Description of Executive and System Programs □ Description of Worker (User) Programs □ Overhead and Throughput Factors □ 7094 Demonstration

CONCLUSION

Multi-Programming Extended for Multi-Processing □ Questions and Answers